

DUKEA, A NEW GENUS OF THE RUBIACEAE (TRIBE MUSSAENDEAE)

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ABSTRACT

The arborescent or shrubby genus *Dukea* of the tribe *Mussaendeae* (*Rubiaceae*) is described as new. The five new species are from five provinces of Panama with the majority at elevations from 2,000 to 3,000 feet. One species from Colombia, *D. chariantha* (Standley) Dwyer is a new combination. The structure of the multiovulate ovary with its septum disposed medianally or, in one species, as a parietal ridge, is an important generic character.

Several years ago I found in the herbarium of the Missouri Botanical Garden a Pittier collection (4223) of a woody rubiaceaceous plant in flower, collected on August 1911 at Dos Bocas, Río Fatô Valley, Province of Colon, Panama. Pittier had simply written *Coussarea* on the label and appended no descriptive field data concerning the plant. Floral dissection reveals that the ovules are numerous and arise from the median septum of the 2-celled ovary. This immediately rules out the possibility of its being a *Coussarea* and reduces its tribal position in the *Rubiaceae* to the first seven tribes according to the arrangement adopted by Standley from Wernham (*Jour. Bot.* **54**: 322-334, 1916) for the New World genera. The presence of valvate corolla lobes immediately eliminates two of these seven tribes and the fact that the collection lacks spines does not suggest the *Naucleaeae*. The *Hedyotideae* made up mostly of herbaceous plants with lacinate stipules may be readily set aside. Inasmuch as the Pittier collection lacks fruit, an impasse may be reached in choosing between the three remaining tribes, *Mussaendeae*, *Cinchoneae*, and *Condamineae*, although general floral structure scarcely suggests the *Cinchoneae*.

Obviously vegetatively and florally similar, but not conspecific with the Pittier material, is a collection of a small tree, 6-10 ft high and bearing white flowers, made in 1940 by Terry & Terry (1847) at the Cana-Cuasi Trail (Camp 2) in the Chepigana District of the Province of Darien, Panama. Its general vegetative habit including the entire stipules, in addition to its 2-celled ovary with numerous ovules arising from a median septum and its valvate corolla lobes, leaves no doubt of its kinship with the Pittier collection. Standley named this *Coussarea colonis* but the binomial is a nomen rejiciendum.

On January 26 of this year Dr. Edwin Tyson, Mr. Kurt Blum and myself collected on Cerro Jefe, Province of Panama, in a mist-swept *Clusia* forest at 2700-3000 ft, a solitary collection of a small tree in mature fruit. Its foliage and stipules bear a striking resemblance to the aforementioned species. Fortunately one flower was available for dissection and this left no doubt as to the relationship of the three collections. Its baccate fruit immediately eliminates the tribe *Cinchoneae* and *Condamineae* and leaves only the tribe *Mussaendeae*. The fruit, in fact, supplied the key to several flowering rubiaceaceous collections which seem to defy classification or were erroneously placed in *Coussarea*.

The tribe *Mussaendeae*, if we are to follow Standley's numerous treatments of the *Rubiaceae* on a national basis, e.g. Colombia (Publ. Field Mus. Nat. Hist., Bot. Ser., **7**: 1-176, 1930); Ecuador (loc. cit. 177-252); Bolivia (loc. cit. 341-486); Costa Rica (loc. cit. **18**: 1264-1380, 1938), has only two genera with terminal inflorescences, *Gonzalagunia* and *Isertia*. Unlike the two collections under study, *Gonzalagunia* has elongate spiciform inflorescences while *Isertia* has an ovary with four to six cells and a much more coarse inflorescence. Interestingly enough the foveolate seeds of our collection serve to strengthen the proposed kinship with *Gonzalagunia* and *Isertia* (as well as suggesting possible affinities with certain genera of the *Gardenieae*, e.g. *Hamelia*, *Hoffmannia*, *Bertiera*, well known in the tropics of the New World). Bremekamp (Verh. Kon. Nederl. Akad. Wet., Afd. Natuurk., Sect. 2, **48**: 1-297, 1952), Verdcourt (Bull. Jard. Bot. État Brux. **28**: 209-290, 1958), and Petit (Bull. Jard. Bot. État Brux. **34**: 1-229, 1964) have stressed the importance of seed anatomy in the *Rubiaceae*.

The site of our collection, Cerro Jefe, is on the Atlantic slope of the Continental Divide, a fact which fits in well with the site of Pittier's collection from the Province of Colon. The summit of Cerro Jefe, presumably visited previously by only one plant collector, Paul Allen, is currently under study by the author as it promises to yield a modicum of new species of phanerogams, principally in the *Rubiaceae*.

A study of these three Panamanian collections suggests the establishment of a new genus. A collection by Lawrance (575) in 1932 from El Humbo, State of Boyaca, 130 miles north of Bogota, Colombia, at approximately 2300 ft elevation was described by Standley as *Coussarea chariantha*. It is a low shrub with white flowers. The multiovulate and biloculate ovary coupled with other floral and vegetative characters readily links it with the Panamanian collections under consideration.

A collection made by Duke (6099) on Cerro Pirre, Province of Darien, Panama, obviously belongs to the new genus. Cerro Pirre, a rich but little known collecting area in Panama (Dwyer, Ann. Missouri Bot. Gard. **51**: 110, 1964) is located more on the Pacific side of the Republic. It is appropriate to remark that the new genus, while admittedly known only from a handful of collections, seems to favor altitudes above 2,000 ft and to hug the Continental Divide on the Costa Rica-Panama border into central Panama, swinging in hook-like style toward the Pacific side at the Colombia-Panama border.

The last species to be included in the new genus is described from two collections from the Province of Bocas del Toro, Panama, one by Cooper (228) and a collection by von Wedel (2248), labelled in the Missouri Botanical Garden herbarium by Standley as *Coussarea colonis* Standley. Both are low trees with white flowers. Only in the structure of the placentae and the presumed abortion of the ovarian septum do the two collections show a radical departure from the other material placed in the new genus.

In five species of the new genus the ovarian septum is clearly seen in transverse section as a median partition with the ovules disposed in four clusters, two per locule. The placentation is thus axile. On the other hand, a cross-section of

the ovary of *von Wedel* 2248 and *Cooper* 228 made above the base, usually reveals four clusters of ovules, each pair of clumps flaring out from a thickened placenta which extends up the ovarian wall and intrudes itself into the locule, but is not sufficiently intruded as to join the placenta opposite and thus fashion a median septum. The ovary is thus uniloculate and the placentation is parietal. The ovary of this species, as well as those of the other species of the new genus, demands careful dissection. The failure to dissect critically the ovary of some species labelled *Coussarea* has caused much difficulty.

DUKEA Dwyer, gen. nov. (tribe *Mussaendeae*)

Arbores parvae vel frutices, ramulis teretibus. *Folia* brevipetiolata lanceolata acuminata papyracea vel crasso-papyracea, venis lateralibus late arcuatis evidenter distantibus infra prominulis; stipulae lineari-subulatae ad triangulares conspicuae plerumque persistates. *Inflorescentiae* terminales corymboso-paniculatae, bracteis subulatis subpersistentibus, bracteolis ad basin pedicellorum affixis. *Flores* multi pedicellati, hypanthio parvo, calyce minore coronario, dentibus 4-5 minutis; petala alba, tubo cylindrico angusto, in gemmis contorto, lobis quam tubo brevioribus, angustis, valvatis reflexisque post anthesin contortis; antherae 4-5 lineari-lanceolatae, filamentis brevibus ad basin tubi affixis; ovarium biloculatum, septo medio, placentis mediis axillaribus, in utrumque loculum bifurcate extantibus, ramis placentarum ultime membranaceis, vel ovarium uniloculatum, utraque placenta parietale prime a basi ovarii oriente tunc bifurcata. *Fructus* parvi cocco-baccati, seminibus multis rotundis foveolatis.

Type species: *Dukea panamensis* Dwyer.

The new genus is named in honor of Dr. James Duke, distinguished ecologist and student of the flora of Panama.

- a. Ovary biloculate; inflorescences 15-30 cm long (Section *Dukea*).
 - b. Inflorescence patulous, 15-30 cm wide; leaves glabrescent above.
 - c. Leaves oblong-lanceolate, scarcely falcate, the blade 2-3 times longer than wide.
 - d. Petioles up to 2 cm long; corolla tube glabrous to glabrescent without; anthers ca 2.5 mm long, acute to subobtuse at the apex; Colombia1. *D. chariantha*
 - dd. Petioles up to 6 cm long; corolla tube obviously pubescent without; anthers up to 4 mm long, attenuate at the apex; Panama2. *D. panamensis*
 - cc. Leaves narrowly lanceolate, obviously falcate, the blade more than 3 times longer than wide3. *D. victoriae*
 - bb. Inflorescence contracted, not more than 6 cm wide; leaves appressed-pilose above.
 - d. Leaves up to 13.5 cm wide; petioles up to 4 cm long; flowers ca 1.5 cm long; lower half of peduncle unbranched4. *D. blumii*
 - dd. Leaves up to 8 cm wide; petioles ca 1 cm long; flowers ca 1 cm long; lower half of peduncle branched5. *D. darienensis*
- aa. Ovary uniloculate; inflorescences up to 6.5 cm long (Section *Uniloculata*)
 -6. *D. euryphylla*.

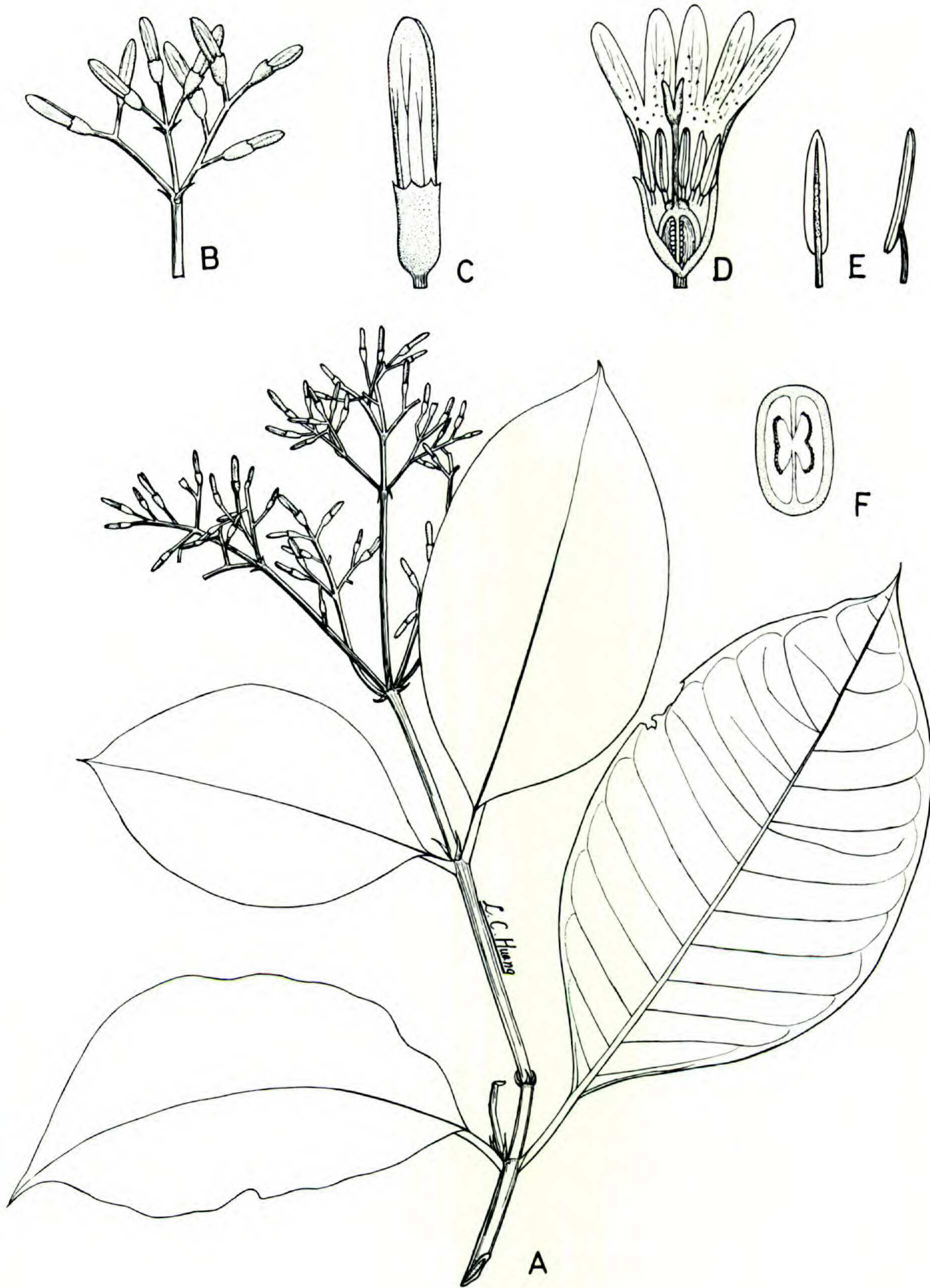


Fig. 1. *Dukea chariantha* (Standley) Dwyer. A, habit ($\times \frac{2}{3}$); B, cymule ($\times 2$); C, bud ($\times 7$); D, flower ($\times 10$); E, anthers ($\times 17$); F, cross-section of ovary, much enlarged. After Lawrance 575 (MO).

1. *DUKEA CHARIANTHA* (Standley) Dwyer, comb. nov.—Fig. 1 (A-F).

Coussarea chariantha Standley, Publ. Field Mus. Nat. Hist., Bot. Ser., **11**: 195, 1936.

COLOMBIA. BOYACA: El Humbo, *Lawrance* 575 (MO, F, type of *Coussarea chariantha*).

2. *DUKEA PANAMENSIS* Dwyer, sp. nov.

Arbores parae, ad 3 m altae, ramulis glabrescentibus. *Folia* petiolata, petiolis 2-5.5 cm longis, ad 0.35 cm latis, stipulis triangularibus, ad 1.5 cm longis, ad 0.6 cm latis, arachnoideo-pubescentibus; lamina elliptico-lanceolata (folia maioria), 17-35 cm longa, 6-13.5 cm lata, apice brevi-acuminata et ultime acutissima, basi attenuato-acuta, crasso-papyracea, venis lateralibus 12-17, eis mediis 1.5-2 cm distantibus. *Inflorescentiae* patulae, ad 23 cm longae, ad 28 cm latae, pyramidatae, pedunculo ad 3 mm lato, pubescente, ramis basalibus forte divergentibus, ad 12 cm longis, ramis superioribus paucis distantibus, cymulis (hic in fructu visis) conspicue patulis pauci-floriferis. *Flores* ca 13 mm longi, pedicellis ad 0.7 cm longis, plano-compressis desuper pubescentibus, bracteolis subulatis, ad 3 mm longis, deciduis; hypanthium rotundum, ca 1.5 mm longum, sparse pubescens, calyce coronario truncato, ad 1 mm longo, dentibus 4, minutis; corolla ca 10.5 mm longa, tubo cylindrico, ca 1 mm lato, intra farinoso, extus pubescente, lobis 4 linearibus, ad 6 mm longis, intus farinosis; antherae 4 lineari-subulatae, ad 4.5 mm longae, attenuato-acuminatae; ovarium septo medio angusto. *Fructus* pedicellati, pedicellis filiformibus, ad 10 mm longis, coccis rotundis, ad 0.5 cm longis, in sicco nigris sparse puberulis, venis paucis gracilibus longitudinalibus, seminibus rotundis, ca 0.4 mm longis, conspicue foveolatis luteis.

PANAMA. PANAMA: Cerro Jefe, 2600-3000 ft elev, *Tyson, Dwyer & Blum* 3326 (holotype MO).

3. *DUKEA VICTORIAE* Dwyer, sp. nov.

Frutices ramulis pubescentibus. *Folia* petiolata, petiolis ad 3 cm longis, ca 1.3 mm latis, stipulis triangularibus, ad 1.5 cm longis, acutissimis pubescentibus; lamina falcato-lanceolata, 16-27 cm longa, 3.5-8 cm lata, apice attenuato-falcato-acuminata papyracea, supra glabrescens infra auro-villosula praecipue in venis, venis lateralibus ad 20, eis mediis 1.5-2 cm distantibus. *Inflorescentiae* certe ad 8 cm latae, patulae, pedunculo ad 5.5 cm longo, ad 0.2 cm lato, pubescente, ramis divergentibus, hic ad 3.5 cm longis, cymulis subflabellate dispositis. *Flores* pedicellis ad 6 mm longis, gracilibus pubescentibus, bracteis subulatis, ad 3 mm longis, bracteolis minutis; hypanthium urceolatum, ad 2 mm longum, sparse pubescens, calyce coronario, ad 1 mm longo, truncato, dentibus 4, minimis; corolla tubo cylindrico, hic ad 2.5 mm longo, 0.8 mm lato, omnino glabro, lobis quam tubo paulo longioribus subcarnosis; antherae 5 lineares, ca 2 mm longis, apice attenuatae sed obtusae, filamentis ad 0.8 mm longis, ad basin tubi affixis; ovarium biloculatum, septo medio, stylo ad 1 mm longo, stigmatibus linearibus, ad 1 mm longis, rectis. *Fructus* non visi.

PANAMA. DARIEN: cloud forest, Cerro Pirre, *Duke* 6099 (holotype MO).

The new species is named in honor of Sister M. Victoria Hayden who assisted the author in several floral dissections of the new genus and numerous dissections of *Coussarea*. The inflorescence of the type is somewhat fragmentary and the floral dissection was made from a late bud stage.

4. **DUKEA BLUMII** Dwyer, sp. nov.

Arbores?, ramulis pubescentibus. *Folia* petiolis 1-4 cm longis, ad 0.3 cm latis, stipulis triangularibus, ad 1 cm longis, arachnoideo-pubescentibus; lamina lanceolata vel ovata-lanceolata, 25-38 cm longa, 9-13.5 cm lata, apice brevi-acuminata et triangulari-acuta, basi acuta, papyracea, venis lateralibus 16-20, eis mediis 1.5-2.5 cm distantibus. *Inflorescentiae* subcylindriformes ad 15 cm longae et 5 cm latae, pedunculo plano-compresso villosulo ad 10 cm longo et 0.25 cm lato, ramis paucis geminatis basi dilatatis fortiter ascendentibus, ad 1.5 cm longis, cymulis patulis pauci-floriferis. *Flores* ad 13 mm longi, pedicellis ad 0.5 cm longis, dense auro-pubescentibus, bracteolis ca 0.5 mm longis, deciduis; hypanthium subfusiforme-urceolatum, ad 3 mm longum, puberulum, calyce brevi, dentibus 5 minutis, ca 0.3 mm longis; corolla ad 9.5 mm longa, tubo angusto-cylindrico (in gemmis vix falcate disposito) extus pubescente, lobis 4 lineatibus, ad 6 mm longis; antherae lineari-subulatae, ad 4 mm longae, attenuato-acuminatae, filamentis ad 2 mm longis; ovarium biloculatum, septo medio angusto, stylo lobis linearibus rectis, ca 2 mm longis. *Fructus* non visi.

PANAMA. COLON: vic Dos Bocas, Río Fatô Valley, Pittier 4223 (holotype MO).

5. **DUKEA DARIENENSIS** Dwyer, sp. nov.

Frutices vel arbores parvae, ad 3 m altae, ramulis diffuso-pilosis. *Folia* petiolis ad 1 cm longis, ca 1 cm latis, stipulis triangularibus, ad 0.7 cm longis, pubescentibus; lamina lanceolata, 15-25 cm longa, 6-8 cm lata, acumine ad 1 cm longo, basi obtriangularis papyracea, venis lateralibus 12-16, eis mediis 1-1.5 cm distantibus. *Inflorescentiae* ad 11 cm longae, ad 6 cm latae, pedunculo villosulo, ad 3 cm longis, ramulis gracilibus, ad 2.5 cm longis, bene distantibus, corymbis terminalibus patulis, floribus in utroque primo ramulo ca 7-5, bracteis bracteolisque subulatis parvis. *Flores* ad 11 mm longi, pedicellis ad 0.25 cm longis, auro-puberulis; hypanthium urceolatum, ca 1 mm longum, villosulum, calyce brevi coronario, ad 1.3 mm longo, dentibus 5 evanescentibus; corolla 4-5 mm longa, tubo in gemmis deorsum angustiore tunc cylindrico, ca 0.8 mm lato, extus puberulo, lobis 4 (-5?) linearibus, ad 4 mm longis; antherae 5 lineares, ca 3 mm longae, filamentis ca 1 mm longis; ovarium septo medio gracili, stylo lobis terminalibus, ca 2.5 mm longis, rectis. *Fructus* non visi.

PANAMA. DARIEN: Cana-Cuasi Trail (Camp 2), Chepigana district, Terry & Terry 1487 (holotype MO).

Standley was suspicious of the wisdom of his decision to include the collection cited above in his *Coussarea colonis* Standley (Field Mus. Nat. His., Bot. Ser., 22: 180, 1940); he remarks “. . . [it] differs from the type (of *C. colonis*) in having

leaf blades only 4.5-5.5 cm wide and smaller flowers, with the corolla tube but 5 mm long." The problem associated with Standley's concept of *Coussarea colonis* is discussed below.

Sectio **UNILOCULATA** Dwyer, sect. nov. Ovarium uniloculatum; inflorescentiae breves. Type species *Dukea euryphylla* (Standley) Dwyer.

6. **DUKEA EURYPHYLLA** (Standley) Dwyer, comb. nov.

Coussarea euryphylla Standley, Publ. Field Mus. Nat. Hist., Bot. Ser., 4: 294, 1929.
C. colonis Standley, loc. cit. 22: 179, 1940, nomen rejiciendum.

Trees up to 4.5 m tall; branchlets glabrous. Leaves with petioles 2-3 cm long, up to 0.3 cm wide; stipules triangular, up to 1.2 cm long, presumably glabrous; blade lanceolate or somewhat falcate-lanceolate, 27-35 cm long, 10-12 cm wide, the acumen up to 1 cm long, thickly papyraceous, the lateral veins 17-20, the median ones 1-2 cm apart. Inflorescence patulous, up to 8 cm long and 6 cm wide, the peduncle ca 2 cm long, slender, ca 1 mm wide, the branches few, up to 2 cm long, the cymules few-flowered. Flowers 12-15 mm long; pedicels up to 0.35 cm long, puberulent; bracts subulate, up to 2 mm long; bracteoles minute; hypanthium urceolate, 2-3.5 mm long, moderately puberulent, the calyx 1-1.5 mm long, crown-like, the teeth 5, minute; corolla 9-15 mm long, the tube cylindrical, puberulent; anthers 5, linear-subulate, up to 4 mm long, attenuate-acuminate; ovary uniloculate, the placentae 2, parietal and arising from the base of the locule, soon bifurcating, the style lobes 2, terminal, subulate, ca 2 mm long. Fruit not seen.

PANAMA. BOCAS DEL TORO: Fish Creek Mts, vic Chiriqui Lagoon, von Wedel 2248 (MO); Almirante (or Buena Vista Camp on Chiriqui Trail?), Cooper 228 (F, type of *C. euryphylla*).

As the synonymy cited above indicates, Standley described *Coussarea euryphylla* in 1929 from a collection by Cooper (228) which he indicated came from the Buena Vista Camp on the Chiriqui Trail, Bocas del Toro, Panama. In 1940, in describing *C. colonis* from Bocas del Toro, Standley designated Cooper 228 as the type indicating Almirante as the collection site. On examining the types of both species in the Chicago Natural History Museum I found that they appear to be based on the same collection, the disparity in collection sites notwithstanding.

Unfortunately, too, Standley failed to observe the uniloculate nature of the ovary of his bilocated type, as well as the fact that the placentae arise basally and extend up the wall with each intruding itself and bifurcating, and the numerous ovules disposed as clusters on the membranaceous placental branches.

The author wishes to thank Mrs. L. C. Huang who prepared the plate for this paper.

Addendum

Dr. James Duke in 1962 collected (5337) what is presumably a woody rubiaceous shrub with white flowers on Cerro Pirre in the Province of Darien, Panama. Superficially its fruiting inflorescence appears like a *Bertiera* of the *Gardenieae* but

the pedicellate, rotund, baccate fruit with foveolate orange seeds strongly resembles the fruit of *Dukea panamensis*; in addition the general character of the foliage immediately suggests the genus *Dukea*. The marcescent surface of many of its fruits is noteworthy but it is probably an artifact created in drying. In the absence of flowers and considering that the specimen vegetatively is in poor condition, I have hesitated to describe it as a new species.